DOCUMENT RESUME

ED 149 995 SE 023 465

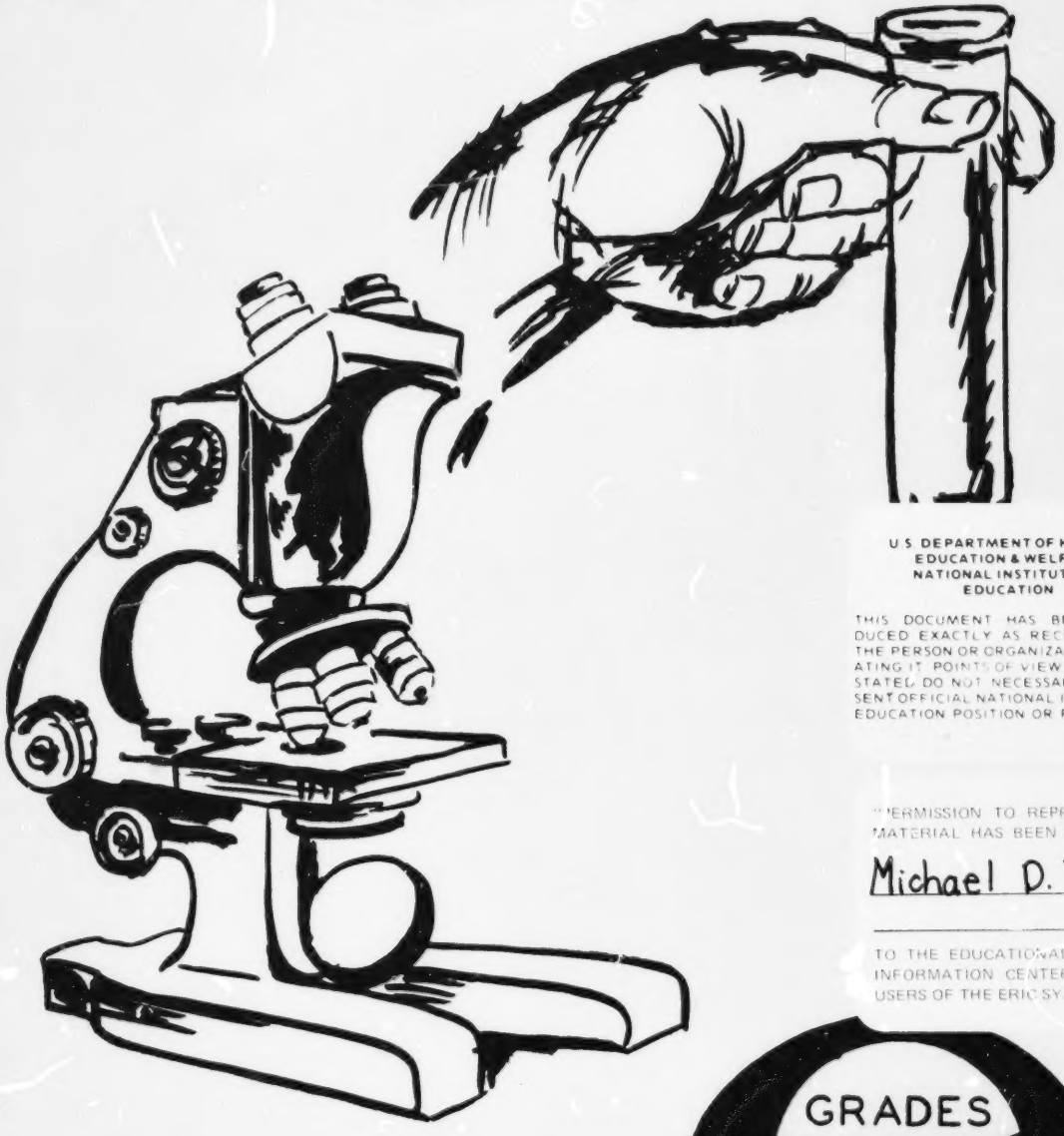
TITLE	Environmental Education, Values for the Future: Technology. Grades 9-12.
INSTITUTION	Illinois State Office of Education, Springfield.
SPONS AGENCY	Bureau of Elementary and Secondary Education (DHEW/OE), Washington, D.C.
PUB DATE	77
GRANT	IOE-551-2-75
NOTE	36p.; For related documents, see SE 023 448-457 and SE 023 459-464; Page 1 ("Explanation of Concept Area") missing from document prior to being shipped to EDRS for filming; Best Copy Available
EDRS PRICE	MF-$0.83 HC-$2.06 Plus Postage.
DESCRIPTORS	Economics; *Environmental Education; *Instructional Materials; Interdisciplinary Approach; *Learning Activities; Natural Resources; *Secondary Education; *Teaching Guides; *Technology; Values
IDENTIFIERS	Elementary Secondary Education Act Title III

ABSTRACT

This booklet on technology is one of a series in environmental education for grades K-12. The activities in this booklet are concerned with the societal and environmental costs of technology. Three basic behavioral objectives are listed with activity options and appropriate subject areas. Information for the nine activities includes materials and resources, procedures, and discussion questions. These interdisciplinary activities, designed for grades 9-12, include surveys, games, studies, and experiments. (MA)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

TECHNOLOGY



U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Michael D. Teeley

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) AND USERS OF THE ERIC SYSTEM."

GRADES 8

ENVIRONMENTAL EDUCATION

A THEMATIC APPROACH WITH THREE PRONGED INTEGRATION

ANTIOCH COMMUNITY SCHOOL DISTRICT 34
TITLE III ESEA

TABLE OF CONTENTS

Page

Explanation of Concept Area 1

Synopsis

Technology 13: At the end of this study the student will be able to list examples where the costs of goods and services vary according to societal demands for these goods and services.

Option 1 - Students study items made from petroleum to learn how scarcity and demand affect costs. 3
Option 2 - Students complete an in depth study in preparation for presenting data on demand and supply changes with fads ... 4
Option 3 - Students deal with supply and demand changes in a gaming situation with changes regulated by the teacher. ... 7

Technology 14: At the completion of this unit the student will be able to explain how some businesses and industries, in the process of producing marketable products, pass on social costs to society.

Option 1 - Students study the automobile as an example of an item with hidden costs we are now beginning to pay. ... 12
Option 2 - Students observe and record any of the local examples of industries passing on their costs to us or the environment. ... 14
Option 3 - Students test and record data on a variety of parameters which affect the environment. ... 21

Technology 15: At the completion of this unit the student will be able to explain why there are trade-offs between 1) population growth and environmental quality, 2) levels of production and environmental quality and 3) the degree or urbanization and environmental quality.

Option 1 - Students survey the school to determine the general attitude toward growth and population. ... 25
Option 2 - Students study examples of trade-offs and conflicts to understand the complexity and interrelationships of the parameters. .. 29
Option 3 - Students play the Planet Management Game and make their own decisions about the trade-offs. ... 32

PAGE 1 "Explanation of Concept Area" missing from document prior to its being shipped to EDRS for filming.

BEST COPY AVAILABLE.

BEHAVIORAL OBJECTIVE:

At the end of this study the student will be able to list examples where the costs of goods and services vary according to societal demands for these goods and services.

SUBJECT AREAS:

Social Studies, Economics, Business

2

OPTION #1 - 1½ days

MATERIALS AND RESOURCES

Paper and pencil

PROCEDURE:

1. Have the students make a list of everything they can think of in their home which is made from petroleum products or which needs petroleum products to work.

2. From all of these items let the students choose any three from their list and find their prices in a store.

3. Through the use of old newspaper and magazine advertisements or store records, check what the prices were for those items ten years ago.

4. Students should list as many factors as possible which caused any price change or lack of price change.

DISCUSSION QUESTIONS:

1. What is the value of the dollar today compared to ten years ago?

2. How does inflation become a factor in costs of goods and services?

3. Can you think of anything that has decreased in price these past ten years? Why has this happened?

4. Will resources always increase in price? Why?

5. Why are some products higher priced when they first appear on the market?

6. What influence does mass production have on the price of goods?

7. How does population affect the costs of goods and services?

OPTION #2 - 4 days

MATERIALS AND RESOURCES

Supplies for making charts
Magic markers
Bulletin boards
Graphs

PROCEDURE: The class will make an in-depth study of something that has made a recent impact on society and is of particular interest to high school students. This example will be based on the tennis explosion.

1. Requirements for the study

   a. Students will work in pairs on an area of their interest.
   b. Students will make a visual display to support their findings.
   c. Students will make a brief oral report on findings and explain the visual display

2. Suggested areas of study

   a. How has the recent demand of tennis rackets and balls affected the price of them over the last five years?
   b. How does the price of tennis rackets and balls vary throughout the area?
   c. What materials are used in the construction of tennis rackets and balls? What are the major competitors for these materials?
   d. How has tennis affected the interests and expenditures of the community?
   e. What social groups have developed from tennis popularity? What activities do these groups take part in? How does the group support itself?
   f. How has tennis affected employment in the area?
   g. Public interview - Two or more groups may wish to work together on a joint questionnaire and then make separate reports.

      (1) Investigate public opinion of tennis courts
      (2) Investigate public opinion of the value of tennis

   h. What expenses are involved in playing tennis? Include such things as equipment and upkeep.
   i. What problems has tennis caused in the community?
   J. Is there a relationship between tennis and the environment?
   k. How extensively are the community tennis courts actually used?
   l. What are the rules and regulations concerning the use of the tennis courts?
   m. What are the advantages and disadvantages of playing tennis?

3. On the fourth or fifth day students report their findings to the rest of the class. Perhaps the visuals can then be used for a display in the room or another part of the school.

DISCUSSION QUESTIONS

1. What are the most important reasons for the tennis "boom"?

2. If there were a network of tennis courts in your community, what do you think would happen to the price of tennis equipment?

OPTION #2 con't

3. How many class members play tennis?

4. Do you play tennis only for recreation? What are other values of playing tennis?

5. Can you think of any reason why the cost of playing tennis would a) decline or b) continue to increase?

SUGGESTED AREAS OF STUDY

1. How has the recent demand of tennis rackets and balls affected the price of them over the last five years?
2. How does the price of tennis rackets and balls vary throughout the area?
3. What materials are used in the construction of tennis rackets and balls? What are the major competitors for these materials?
4. How has tennis affected the interests and expenditures of the community?
5. What social groups have developed from tennis popularity? What activities do these groups take part in? How does the group support itself?
6. How has tennis affected employment in the area?
7. Public interview - Two or more groups may wish to work together on a joint questionnaire and then make separate reports.
   a. Investigate public opinion of tennis courts
   b. Investigate public opinion of the value of tennis
8. What expenses are involved in playing tennis? Include such things as equipment and upkeep.
9. What problems has tennis caused in the community?
10. Is there a relationship between tennis and the environment?
11. How extensively are the community tennis courts actually used?
12. What are the rules and regulations concerning the use of tennis courts?
13. What are the advantages and disadvantages of playing tennis?

OPTION #3 - 2 hours

MATERIALS AND RESOURCES

Clock or watch
Small box
Paper and pencil for each student
Scissors
Ditto masters and access to a ditto copier
"Game Overview" card for each group of five students in the class

PROCEDURE: (Student directions) Read to the students and divide them into groups of five.

Consumer demand for a product determines, to a large degree, the price of that product. Many factors influence the level of consumer demand which in turn influence product price. The purpose of this exercise is to examine how some of the factors operate to help influence demand for and price of a product. Imagine that you are a member of the Presidential Economic Advisory Board. Your task is to predict how the price and consumer demand for lemons will change in a variety of different situations. "Specific Situation" cards for each group of five students in the class:

Situation 1: "A crop failure strikes two-thirds of the country's lemon groves."

Situation 2: "A team of medical researchers discover that lemons contain a unique vitamin which tends to prevent cancer for people who eat a lemon a day."

Situation 3: "Lemon grove workers form a labor union and go on strike to protest poor wages and working conditions."

Situation 4: "A lemon-flavored drink is invented which contains an amount of the cancer-preventing vitamin equal to that contained in a lemon, but the new drink is only a third as expensive to produce as natural lemon juice and many people think it tastes better."

Situation 5: "A California lemon grower discovers that crop yield can be quadrupled by adding a newly discovered fertilizer to the orchard soil."

Situation 6: "The federal government signs a trade agreement with Cuba whereby two-thirds of all lemons grown in the U.S. over the next five years will be traded to Cuba in exchange for sugar and rum."

1. Have the students write their names on equal-sized slips of paper suitable for a name drawing.

2. Place these name slips into the small box and draw names from the box so as to randomly divide the class into groups of five.

3. Prior to this exercise, have the situation cards typed and dittoed so that one card can be distributed to each group if the class is divided into groups of five.

OPTION #3 con't

4. Also previous to the exercise, have a set of "Game Overview" cards typed and dittoed so that one card can be distributed to each group if the class is divided into groups of five.

5. Distribute one card to each group.

6. At every ten-minute interval over the next hour, distribute one situation card to each group, so that by the end of the hour, all groups have discussed and written their comments in response to each situation as described on the cards.

7. As the groups receive each situation card, have them predict how and why the demand for and price of lemons would be affected. These predictions should be recorded for each situation.

DISCUSSION QUESTIONS

1. In a free enterprise economy, such as operates in the U.S., is the price of lemons flexible or inflexible as different situations arise?

2. Do the groups' predictions differ from one another about the same situations?

3. In general, how does consumer demand for lemons affect their price?

4. What are some of the factors which influenced consumer demand for lemons?

5. Does this exercise reflect real-world product price fluctations?

6. In the real world what factors have historically contributed to consumer demand for petroleum products and their prices?

7. In the case of lemons, would consumer demand have any effect upon the wages and working conditions of lemon grove laborers? Why or why not?

8. How does the price of lemons really change over a period of one year?

9. How can you account for these fluctuations?

10. How have changes in consumer demand for autos altered raw material usage over the past fifty years?

11. Besides lemons, what other product prices fluctuate yearly? How can you account for these fluctuations?

STUDENT DIRECTIONS

CONSUMER DEMAND FOR A PRODUCT DETERMINES, TO A LARGE DEGREE, THE PRICE OF THAT PRODUCT. MANY FACTORS INFLUENCE THE LEVEL OF CONSUMER DEMAND WHICH IN TURN INFLUENCE PRODUCT PRICE. THE PURPOSE OF THIS EXERCISE IS TO EXAMINE HOW SOME OF THE FACTORS OPERATE TO HELP INFLUENCE DEMAND FOR AND PRICE OF A PRODUCT. IMAGINE THAT YOU ARE A MEMBER OF THE PRESIDENTIAL ECONOMIC ADVISORY BOARD. YOUR TASK IS TO PREDICT HOW THE PRICE AND CONSUMER DEMAND FOR LEMONS WILL CHANGE IN A VARIETY OF DIFFERENT SITUATIONS.

CONSUMER DEMAND FOR A PRODUCT DETERMINES, TO A LARGE DEGREE, THE PRICE OF THAT PRODUCT. MANY FACTORS INFLUENCE THE LEVEL OF CONSUMER DEMAND WHICH IN TURN INFLUENCE PRODUCT PRICE. THE PURPOSE OF THIS EXERCISE IS TO EXAMINE HOW SOME OF THE FACTORS OPERATE TO HELP INFLUENCE DEMAND FOR AND PRICE OF A PRODUCT. IMAGINE THAT YOU ARE A MEMBER OF THE PRESIDENTIAL ECONOMIC ADVISORY BOARD. YOUR TASK IS TO PREDICT HOW THE PRICE AND CONSUMER DEMAND FOR LEMONS WILL CHANGE IN A VARIETY OF DIFFERENT SITUATIONS.

CONSUMER DEMAND FOR A PRODUCT DETERMINES, TO A LARGE DEGREE, THE PRICE OF THAT PRODUCT. MANY FACTORS INFLUENCE THE LEVEL OF CONSUMER DEMAND WHICH IN TURN INFLUENCE PRODUCT PRICE. THE PURPOSE OF THIS EXERCISE IS TO EXAMINE HOW SOME OF THE FACTORS OPERATE TO HELP INFLUENCE DEMAND FOR AND PRICE OF A PRODUCT. IMAGINE THAT YOU ARE A MEMBER OF THE PRESIDENTIAL ECONOMIC ADVISORY BOARD. YOUR TASK IS TO PREDICT HOW THE PRICE AND CONSUMER DEMAND FOR LEMONS WILL CHANGE IN A VARIETY OF DIFFERENT SITUATIONS.

9

OPTION #3

SITUATION 1: "A CROP FAILURE STRIKES TWO-THIRDS OF THE COUNTRY'S LEMON GROVES."

SITUATION 2: "A TEAM OF MEDICAL RESEARCHERS DISCOVER THAT LEMONS CONTAIN A UNIQUE VITAMIN WHICH TENDS TO PREVENT CANCER FOR PEOPLE WHO EAT A LEMON A DAY."

SITUATION 3: "LEMON GROVE WORKERS FORM A LABOR UNION AND GO ON STRIKE TO PROTEST POOR WAGES AND WORKING CONDITIONS."

SITUATION 4: "A LEMON-FLAVORED DRINK IS INVENTED WHICH CONTAINS AN AMOUNT OF THE CANCER-PREVENTING VITAMIN EQUAL TO THAT CONTAINED IN A LEMON, BUT THE NEW DRINK IS ONLY A THIRD AS EXPENSIVE TO PRODUCE AS NATURAL LEMON JUICE AND MANY PEOPLE THINK IT TASTES BETTER."

SITUATION 5: "A CALIFORNIA LEMON GROWER DISCOVERS THAT CROP YIELD CAN BE QUADRUPLED BY ADDING A NEWLY DISCOVERED FERTILIZER TO THE ORCHARD SOIL CALLED LEMONAID."

SITUATION 6: "THE FEDERAL GOVERNMENT SIGNS A TRADE AGREEMENT WITH CUBA WHEREBY TWO-THIRDS OF ALL LEMONS GROWN IN THE U.S. OVER THE NEXT FIVE YEARS WILL BE TRADED TO CUBA IN EXCHANGE FOR SUGAR AND RUM."

10

BEHAVIORAL OBJECTIVE:

At the completion of this unit the student will be able to explain how some businesses and industries, in the process of producing marketable products, pass on social costs to society.

SUBJECT AREAS:

Social Studies, Science

11

OPTION #1 - Time is flexible.

MATERIALS AND RESOURCES

E.P.A.
Costs Breakdown survey form
Auto dealers

PROCEDURE:

1. Explain you want to purchase a new auto and you want to know the complete breakdown of costs.

2. Have groups visit local auto dealers to find how much a car costs in detail and how much pollution control devices cost.

3. Groups should present their findings and display the same.

DISCUSSION QUESTIONS

1. Have auto manufacturers always been willing to acknowledge the need for pollution devices in the past? Why or why not?

2. Discuss the cost of adding pollution control devices to autos.

3. Do auto manufacturers sometimes complain about the cost of air pollution devices? Why?

4. Why ultimately pays the cost for adding these devices?

5. Who should be responsible for absorbing costs from profits to pay for the pollution control devices?

6. What better ways are there to solve the problem rather than adding devices? (such as increasing the efficiency and the by decreasing exhaust emissions)

7. Why do you think auto manufacturers should develop an engine that has a higher efficiency which eliminates pollution at the source rather than to add a device to get rid of it after it is already there?

FURTHER ACTIVITIES

Have the students research local business and industry to determine if they pass on to the consumer any of their pollution control costs.

12

COSTS BREAKDOWN*

VEHICLE: CAR VAN MAKE _____

TYPE: 2-door 4-door wagon recreational work

BASE COST: (no accessories) $3000-4000 $4001-5000 $5001-6000 $6001-7000 $7001-8000 $8001-9000+

ACCESSORIES COST

Power steering	_____
Power brakes	_____
Air conditioning	_____
Radial tires	_____
AM/FM radio	_____
Stereo radio	
Cruise control	_____
Interior comforts	
Exterior luxury	_____
4-wheel drive	_____
Automatic	
Overdrive	_____

Engine options

Small engine	_____
Medium engine	
Large engine	_____
Fuel injection	_____
Other	

TOTAL OPTIONS COSTS _____

SUM TOTAL _____

*No dealer prep or taxes

OPTION #2

TIME: Day 1 - Field trip
Day 2 - Compile data and draw graphs.
Day 3 - Discussion of findings

MATERIALS AND RESOURCES

Access to a nearby stream or river
Glass or clear plastic collecting jars
Masking tape
Felt ink markers
Secchi disc and cord (see appendix)
Hach dissolved oxygen test kit (optional)
Plankton net (see appendix)
Bottom sediment scoop (see appendix)

PROCEDURE:

1. Have the students construct and collect any of the above materials which are not readily available (See appendix)

2. Choose a stream or river for examination that runs through or past your community.

3. Moving downstream, take a number of water samples at one-half mile intervals.

4. At each sampling location, have each student keep a record of the following:

   a. degree of water turbidity
   b. results of dissolved oxygen test, if used
   c. odor of water - Develop a list for the class.
   d. amount and kind of predominant shore vegetation
   e. kind of human activity taking place in the area such as housing, farms, industrial, woodlot, etc.
   f. amount and kind of aquatic vegetation
   g. observable aquatic animal life present
   h. overall aesthetic quality of the water

5. Obtain a sample of the water and the bottom sediment at each location. Label these carefully according to location with masking tape and marking pens.

6. Upon returning, make up a large "river quality" table showing results of the tests and observations from site to site going downstream.

7. Arrange the water and sediment samples on a table in the order in which they were taken.

8. Have the students make careful observations about each water and sediment sample on the following inputs:

   a. odor
   b. overall clarity of water
   c. amount and kind of animal life present in water and sediment sample

OPTION #2 con't

9. Have the students graph dissolved oxygen test results, if used, with dissolved oxygen content at test sites on the vertical axis and distance from the first test site on the horizontal axis.

10. Have them graph Secchi disc results with disc measurement on the vertical axis and distance from first test site on the horizontal axis.

DISCUSSION QUESTIONS

1. How did the Secchi disc and dissolved oxygen test results change as they were taken farther downstream?

2. What makes water turbid?

3. Which of those turbidity causes can be attributed directly to human activity?

4. What is the relationship between degree of turbidity and aquatic plant growth?

5. If dissolved oxygen test results differed from point to point, how can you account for the differences?

6. What effect would varying degrees of dissolved oxygen have upon aquatic animal life?

7. Did the variety of animal life in the water change as you went downstream? Why or why not?

8. Does the sediment appear to change in some ways as you went downstream?

9. At any one test site did the quality of the water appear to change significantly? Why or why not?

10. Identify the points along your tested area of the river where industry or other human activity might alter water quality.

11. Do your tests and observations suggest any relationship between human activity and altered water quality?

12. What businesses or industries along your river can be identified as having a significant impact upon local water quality?

13. In what ways does the recreational value of the river increase or decrease as it flows along?

14. In what ways does your community make use of the river?

15. Are some of those uses in conflict with others? Which use dominates?

16. Does your community have a policy regarding water quality standards? If so, what are they?

17. Are those standards enforced? Why or why not?

15

OPTION #2 con't

18. What are coliform bacteria? How are they used as an index of water quality?

19. What is meant by "passing along the social cost" of industrial pollution?

REFERENCE

Dachert, Russell E., Snooks, Pearson, L; Outdoor Education Equipment, Interstate Printers and Publishers, Inc; Danville, Illinois, 1974.

APPENDIX

SECCHI DISK

MATERIALS:

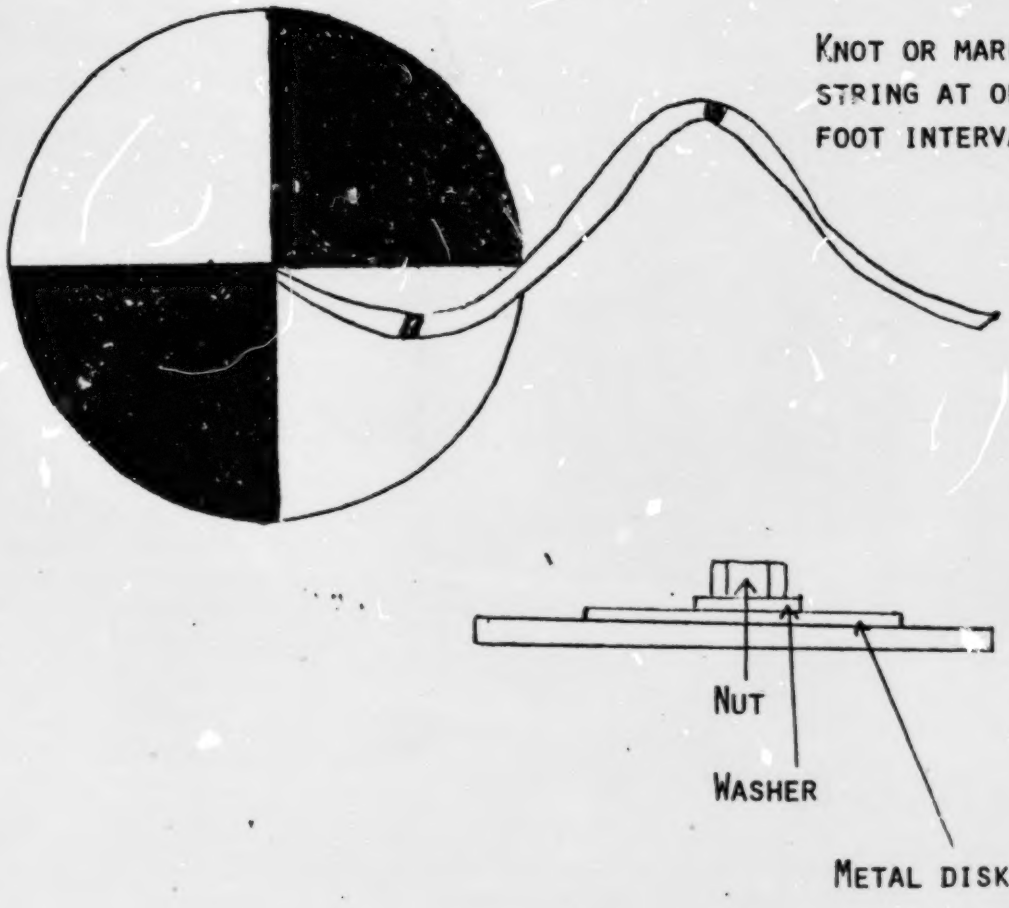
METAL DISC 5-6 INCHES IN DIAMETER CUT FROM LIGHTWEIGHT METAL, METAL WASHERS, HEAVY STRING, BLACK PAINT, WHITE PAINT, EYEBOLT, NUTS.

PROCEDURE:

1. CUT DISK FROM LIGHTWEIGHT METAL.
2. DRILL HOLE IN CENTER FOR THE EYEBOLT.
3. PLACE A METAL WASHER AND NUT ON THE EYEBOLT ON BOTH SIDES OF THE DISK. ADD MORE WASHERS IF EXTRA WEIGHT IS NEEDED.
4. PAINT DISK BLACK AND WHITE FOR CONTRAST.
5. ATTACH A HEAVY STRING TO EYEBOLT AND MARK IT AT ONE FOOT INTERVALS.
6. LOWER THE DISK INTO WATER UNTIL IT DISAPPERS AND TAKE A DEPTH READING AT THIS POINT, LOWER IT A FEW FEET DEEPER, THEN RAISE IT UNTIL IT BECOMES VISIBLE. TAKE A DEPTH READING AT THIS POINT. AVERAGE THESE TWO READINGS. THIS IS CALLED THE LIMIT OF VISIBILITY.

APPENDIX

SECCHI DISK CON'T



7. THE SECCHI DISK CAN BE LOWERED INTO STREAMS FROM A BOAT, AN OVERHANGING BRANCH, OR A BRIDGE.

APPENDIX

SEDIMENT SCOOP

MATERIALS:

No. 10 CAN, BROOM HANDLE, NUTS AND BOLTS, HAMMER AND NAILS, DRILL

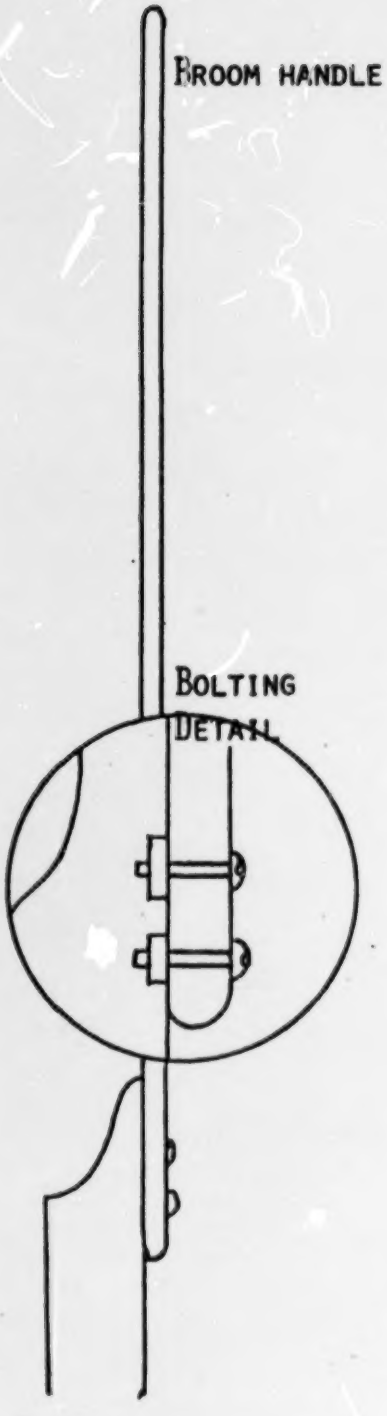
PROCEDURE:

1. USING TIN SHEARS, CUT A NO. 10 CAN INTO A SCOOP AS SHOWN.
2. PUNCH SEVERAL SMALL NAIL HOLES IN BOTTOM OF CAN TO ALLOW WATER TO DRAIN.
3. DRILL TWO HOLES THROUGH THE BROOM HANDLE AND CAN.
4. BOLT CAN SECURELY TO THE END OF THE HANDLE.

APPENDIX

SEDIMENT SCOOP CON'T

CUT NO. 10 CAN
TO SCOOP FORM.



OPTION #3

TIME: 7 days - 2 days to determine base level of pollutant in city
2 days to determine base level of pollutant in industrial areas
1 day to compile data
2 days to discuss problems and write up report for city and industrial area

MATERIALS AND RESOURCES

Access to city hall, sewage treatment plant, and to local sewage collection areas
12 to 20 dishes of uniform size
Glycerin - 1 pint
Water test unit to include tests for oxygen content, nitrogen level, phosphate level, and mineral content
Filter paper and funnels
Noise meter or use of level meter on tape recorder
Microscopes for examination of levels of micro organisms
Beakers
Titration tubes
Litmus paper and water mister

PROCEDURE:

1. Tests for air pollution

   a. Using dishes to collect particulate matter - Glycerin water mixture used so as to not allow water to evaporate. (Two days time for both city and industrial areas)
   b. Collect mixture and filture through for gross amounts of particulate matter and other materials which might have been collected.
   c. Using a mister and Litmus paper, determine the pH of the air surrounding the community and the industrial area. (Minimum of two days time)

2. Tests for noise pollution

   a. General tape recordings of areas around the city and industrial areas at all times during the day and when both the city and the industrial areas are in minimal use.
   b. Determine level of these noises by using either decibel meter or sound level meter on tape recorder.

3. Tests for water pollution

   a. If river flows through or around town, test river before it comes near town and after it leaves town; also, test river immediately after it leaves or goes near industrial area.
   b. Using water test kit establish levels of materials in water.
   c. Go to sewage treatment plant and test sewage as it is being treated and water after it has been treated.
   d. Obtain from the city the kind and type of sewage treatment and levels they expect from their treatment of sewage.
   e. Obtain from the city amounts of sewage treated for the entire city and for the industrial area and find out if it is possible to obtain test results directly from sewage as it comes out of industrial areas before it is mixed in with entire city. If possible, test sewage at these points.

OPTION #3 con't

4. Gather data from various tests, compile data, and bar graph data against each other, i.e. complete city against industrial area.

5. Write up results of collected data and present copy of data and some possible solutions to problems to city council or mayor and to plants in industrial areas being tested.

6. If more than one class is to be involved more than one area of the city can be tested against the entire city to give a total idea as to the areas in the city which add to the problems of the entire city more or less than other areas of the city.

DISCUSSION QUESTIONS

1. If we were able to shut down industrial areas until pollution levels were lowered, how would society be affected?

2. How could the city effectively change the pollution levels within the city itself?

3. Why are given areas in the city lower in levels of pollution than others?

4. What political action committees or stands should we as a group try to influence our parents toward?

REFERENCES

Chemistry teacher
City Hall - Mayor or City Manager
State government to establish pollutant limits for state control
Zoning controls on pollutants

OPTION #3

PARAMETER (pollutant)	DATE / LEVEL	DATE / LEVEL	DATE / LEVEL	DATE / LEVEL

23

BEHAVIORAL OBJECTIVE:

At the completion of this unit the student will be able to explain why there are trade-offs between 1) population growth and environmental quality, 2) levels of production and environmental quality and 3) the degree of urbanization and environmental quality.

SUBJECT AREAS:

Social Studies, Mathematics

OPTION #1

MATERIALS AND RESOURCES

Large sheets of poster paper and colored markers
Shoebox and scissors
"Environmental Attitudes" questionnaire

PROCEDURE:

1. Develop with the students a questionnaire designed to sample attitudes about urbanization.

2. Divide the class into teams of three students each.

3. Assign each team to a group of classes.

4. Obtain permission from other teachers for students in your class to distribute the questionnaires to students in their classes.

5. Have the students go in groups of three to other classes to explain the questionnaire, distribute them, and collec them when completed. Ten minutes per class is sufficient.

6. Be sure to keep the class questionnaires separate.

7. After all completed questionnaires have been collected, have the students calculate each class average (mean) and then the entire sample's response to each question.

8. Post these on a table which the students have prepared on the sheet of poster paper. Use a different colored ink marker to post each class average for the responses.

9. After discussing the pertinent questions, place the poster where everyone in the school can see it. Also post a blank sample questionnaire.

DISCUSSION QUESTIONS

1. On the basis of responses to questions 1 and 2, does it appear that the people you sampled desire more, fewer, or the same number of children as are in their present families?

2. Do the numbers given in response to 1 and 2 vary with the grade levels of the classes you sampled?

3. How can you account for differences between the responses to 1 and 2?

4. Do the respondents generally seem willing or unwilling to limit their family size to two children, the replacement level?

5. Does this willingness or unwillingness vary across class age levels? Why or why not?

OPTION #1 con't

6. How do answers to 4 and 5 compare? Are the answers in conflict with each other?

7. How is environmental quality affected by increased population and a general desire for a higher material standard of living?

8. In light of your answer to #7, how do you view responses to questions 2, 3, and 10? Are the responses in conflict or are they consistent with one another?

9. Since everyone, rich or poor, must have food, shelter, and adequate health, which income level suffers the most from overall price increases of these commodities?

10. In the light of your answer to #9, how do you interpret responses to questions 8 and 9?

11. Are responses to questions 4 and 5 in conflict or are they consistent with each other?

12. How did respondents tend to answer question #7? How can you account for such tendencies?

13. Are responses to questions 4 and 5 generally consistent with or in conflict with responses to question 7? Why or why not?

14. Is it possible for everyone who wants to, "to live in this country"? Why or why not?

15. What is the effect upon areas surrounding an urban center when some people become able to "move to the country" while working in the city?

16. On the basis of the response to the questionnaires, what guesses can you make about the way environmental quality is changed when populations grow?

17. How is environmental quality affected by widespread desires for increased material wealth?

18. Are people's reasons for wanting to live outside the city in conflict or consistent with the effects which their desired lifestyle will have upon environmental quality?

19. Is people's willingness to make personal sacrifices as outlined in question 5 in conflict or consistent with their desires for a high-quality environment? Why or why not?

20. How can you account for varying responses to questions #6?

ENVIRONMENTAL ATTITUDES QUESTIONNAIRE

"This questionnaire was developed to help our class learn more about peoples' reactions to the environmental crisis. To assist us, please answer the following questions as sincerely as you can based upon the way each question or statement is worded."

The first two questions can be answered by entering a number in the blank space.

You can respond to the next eight statements by placing an 'x' above the number on the five point scale which best represents your reaction to the statement. Although individual responses will remain anonymous, each class average response to each question or statement will be posted after the questionnaires have been returned.

1. In my present family there are _____(number) children.

2. I would like to have ____ (number) children of my own.

3. As an adult I would be willing to limit the number of children in my family to just two.

1	2	3	4	5
strongly agree	agree somewhat	neutral	disagree somewhat	strongly disagree

4. As an adult I would like to be able to own more things than my own parents now have.

1 2 3 4 5

5. In order to help solve environmental problems I woudd be willing to make sacrifices in the way I live, i.e. use car pools or mass transit instead of driving a personal car to work.

1 2 3 4 5

6. Future changes in the technology of producing consumer goods will probably eliminate most causes of pollution by the time I am an adult.

1 2 3 4 5

7. I would rather live in the country than in the city as an adult.

1 2 3 4 5

8. One good way to help correct environmental problems would be to allow the prices of goods to rise so that everyone consumes less energy and fewer resources.

1 2 3 4 5

9. Everyone suffers from the effects of pollution to the same degree.

1 2 3 4 5

10. I would be willing to pay higher prices for goods if they could be produced so as to have less negative effects upon environmental quality, i.e. pollution-free autos, containers, electricity, and other things.

1 2 3 4 5

27

ENVIRONMENTAL ATTITUDES OF _____
(your school's name)

QUESTIONS	1	2	3	4	5	6	7	8	9	10
CLASS A										
CLASS B										
CLASS C										
CLASS D										
CLASS E										
CLASS F										
AVERAGE FOR ENTIRE SAMPLE										

OPTION #2

MATERIALS AND RESOURCES

Chart 1, one per group
Encyclopedias or other source books such as The Hungry Planet, George Borgstrom, 1967 and Circle of the World, Felanders, 1971.
The TVA: Conservation in the Tennessee Valley - FS/C
Los Angeles: City of Automobiles - FS/C
Atlanta, Georgia: Progress and Problems - FS/C

PROCEDURE:

1. On the board list 1) population growth, 2) levels of production and 3) degree of urbanization.

2. Draw attention to the fact that each of these areas has a rate of change, i.e. rate of growth, rate of change of production.

3. Suggest that each of these affects our environment, the effect depending not only on the rate but also on the policies used in governing or controlling these areas.

4. Divide the class into thirds with each third assigned to one of the three areas listed above.

5. Using the source books and encyclopedias, students are to look up the assigned area and read to find out the results of an increase in rate in each area.

6. Groups can select a reader and have others take turns recording answers. Suggest that as the recorders are listening, if they think of a result not mentioned, they may list it.

7. Distribute Chart 1, one per group. Have each group fill in the area assigned to them.

8. Each group selects one or two people to present its findings to the other two groups.

9. Have one person compile a master chart filling in all three areas.

DISCUSSION QUESTIONS

1. How is the concept of "more is better" a bad one?

2. As society advanced how did each area change in quality in relation to quantity?

3. At what time in history did these areas begin to snowball or increase at a rate that was much greater than before?

4. What evidence is there that things got out of hand? When?

5. To prove that these areas are not isolated, briefly explain how each affects the other.

OPTION #2 con't

Population Growth	Levels of Production
Population Growth	Degree of Urbanization
Level of Production	Degree of Urbanization

OPTION #2

CHART 1

1. POPULATION GROWTH	
little or none	great expansion
2. LEVELS OF PRODUCTION	
little or none	great level
3. DEGREE OF URBANIZATION	
mostly rural	large cities

EFFECTS OF THESE ON ECOLOGY

OPTION #3

MATERIALS AND RESOURCES

Planet Management Game, E^2 Office
Chart 2
Overhead transparencies and markers
Overhead projector

PROCEDURE:

1. The background is explained in detail in the game itself.

2. Set up the class so that they are working in four teams - each team will control one variable - population, food, income, and environmental quality.

3. Divide the money among the four groups so that population has 4 bux and the others 2 bux each.

4. Each group has three minutes to decide what projects to use its money for. Perhaps you can allow five minutes for the first couple of rounds.

5. Have one student read the "computer" results and one student mark them on the master transparencies, Chart 2. NOTE: You will need four charts for the class.

6. Play the game once without negotiations between teams and review the results.

7. After the review set up the teams so that they may make trade-offs and negotiate for the use of BUX. Give them six minutes for each round during this period. Any unallocated BUX can be used as one or two selected individuals deem necessary.

8. After this session is complete, review the results of the two games and answer the discussion questions.

DISCUSSION QUESTIONS

1. Which game was the most effective? Explain.

2. What do we mean by <u>winning</u> in this simulation?

3. Is the process of negotiation and trading off a useful process? Explain.

4. Which factors had the most control in the overall program? Explain.

5. Are there any factors which are measured indirectly in this simulation? How do these occur?

6. How can we determine the specific interactions taking place?

7. Can you suggest possible variables to add to the simulation?

OPTION #3

CHART 2